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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DS, GS, AND DEPOT MAINTENANCE MANUAL
CABINET, ELECTRICAL EQUIPMENT CY-6177/GRC

Headquarters, Department of the Army, Washington, D.C.
11 March 1970

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the input rectifier or on the input ac and dc line connections. Serious injury or death may result from contact with these points.

DON'T TAKE CHANCES!

WARNING

Maintenance personnel should be familiar with the requirements of TB SIG 291 before using this equipment. Failure to follow the requirements of TB SIG 291 could result in injury or DEATH.

CAUTION

Do not make resistance measurements on the transistorized circuits of this equipment without first checking the instructions given in chapter 2.

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CHAPTER 1

FUNCTIONING OF CABINET, ELECTRICAL EQUIPMENT CY-6177/GRC

1-1. Scope

a. General. This manual contains instructions for DS, GS, and depot maintenance for Cabinet, Electrical Equipment CY-6177/GRC (main case). Included are instructions for troubleshooting, testing, and repairing the equipment and replacing maintenance parts. Listings of tools, materials, and test equipment for maintenance are also provided. Detailed functioning of the main case is covered in this chapter. Operator and organizational maintenance is covered in TM 11-5820-672-12.

b. Report of Equipment Manual Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-ME-NMP-EM, Fort Monmouth, N.J. 07703.

NOTE

For other applicable forms and records, refer to paragraph 1-3, TM 11-5820-672-12.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. System Application

The main case houses two Receiver-Transmitters, Radio RT-698/ARC-102, Coupler, Antenna CU-1669/GRC, Filter, Bandpass F-1138/GRC, Power Supply PP-4720/GRC, and all necessary mounting racks for Radio Set AN/GRC-158. Space is provided to mount a third transceiver (not supplied) used as a cold spare (not electrically connected). The components are mounted on racks within the main case. Each component mounting rack is provided with two locating pins and one or two electrical connectors. The pins guide the components into position and the electrical connectors interconnect the components of the radio set. Two thumbscrew clamps are provided at the front of each mounting rack (fig. 2-2) to secure the components in the racks. Cool air enters the main case through a filter located behind the louvered front cover and is exhausted from the rear exhaust port by an internal blower. The mounting racks contain plenum chambers to distribute cooling air to the two transceivers, antenna coupler, and power inverter. External mounting provisions at the top rear corners of the main case are provided for the use of either two whip antennas or long-wire antenna adapters. Six circuit breakers and five electrical connectors are provided on the rear panel of the main case for external electrical connection.

1-4. Block Diagram Analysis

The input switching network (fig. 1-1) receivers 27.5 volts direct current (dc) from Power Supply PP-4721/GRC (power supply), or an external power source (dc power supply). When circuit breakers CB1 through CB6 are closed, 27.5 volts dc is connected to the No. 1 and No. 2 transceivers, preselector, and the power inverter. The 27.5 volts dc applied to the power inverter, also applies power to spike suppressor A1 and relays K1 through K7. The state of the input switching network and re-

lays K1 through K7 determines which of the following inputs are fed to the radio set; digital tune in process, key line, or digital tune enable. Sine wave filter FL1 is fed 115 volts, 400 Hertz (Hz) from transceiver No. 1 or No. 2, depending on the state of relay K4. The filtered 115-volt, 400-Hz output from sine wave filter FL1 is fed to the antenna coupler. Blower B1 is fed 115 volts, 400 Hz from the power inverter.

1-5. Spike Suppressor A1

a. Spike suppressor A1 (fig. 3-2) protects the power inverter by removing the ground return from the power inverter when an input voltage spike occurs. A transient voltage spike on the 27.5-volt dc input line could damage transistors in the power inverter. (Literature coverage of Power Supply PP-4720/GRC is contained in TM 11-5820-514-12 and TM 11-5820-514-35). Spike suppressor A1 removes the ground return from the power inverter until the conclusion of a 200-millisecond time delay and only after the supply voltage has decreased below 30 volts.

b. The power inverter normally is connected to ground through two parallel paths consisting of R9 and Q7 and R10 and Q8. Transistors Q6, Q7, and Q8 are forwarded-biased by the 27.5 volts dc applied through parallel resistors R11 and R12 to the base of Q6.

c. The 27.5-volt dc supply voltage is applied across a voltage-divider network consisting of resistors R1 and R2 and series-connected Zener diodes CR1 and CR2. The breakdown voltage of CR1 is 9.1 volts and the breakdown voltage of CR2 is 30 volts. A supply voltage that is below 39.1 volts will appear across R1, R2, CR1, and CR2. If the supply voltage increases to approximately 40 volts, the voltage across R2 is then high enough to forward-bias Q3, causing it to conduct. When Q3 conducts, the collector voltage supplies forward bias to transistor Q5. When Q5 conducts, transistors Q6, Q7, and Q8 are cut off due to the voltage drop across R11 and R12. When cutoff occurs, transistors Q7 and Q8 remove the ground return from the power inverter.

d. When conducting, transistor Q3 also supplies forward bias to transistors Q1 and Q2, which causes Zener diodes CR1 and CR2 to short-circuit. The voltage across R2 increases and maintains transistor Q3 in conduction even though the voltage spike may have decreased in magnitude.

e. Two-hundred milliseconds (ms) after transistors Q7 and Q8 are cut off, transistor Q4 conducts, the emitter voltage of Q2 is increased causing cutoff and removing the short-circuit across Zener diode CR2. If the applied voltage across the voltage-divider network of R1, R2, CR1, and CR2 is above 30 volts after the 200-milli-second time delay, the voltage across R2 maintains transistors Q3 and Q5 forward-biased. Ground potential is applied to the base of transistor Q6 by the conduction of Q3 and Q5, therefore keeping Q6, Q7, and Q8 from conducting. This action removes the ground return path from the power inverter. After the 200-millisecond time delay, if the supply voltage is less than 30 volts across the voltage-divider network of R1, R2, CR1, and CR2, Q3 is no longer forward-biased, and the forward bias is removed from Q5. The more positive collector voltage of Q5 now supplies forward bias for Q6, Q7, and Q8. With Q6, Q7, and Q8 conducting, ground is returned to the power inverter, turning it on. Transistors Q6, Q7, and Q8 also supply reverse bias to transistor Q4 which then cuts off transistor Q1. The short circuit across Zener diode CR1 is removed when Q1 is cut off. This action returns spike suppressor A1 to its normal condition.

1-6. Power Control and Protective Circuits

a. Power Control Circuits.

(1) The main case is fed source power from the power supply (fig. 3-3) or from an external 27.5-volt dc power supply. When the power supply is supplying power to the main case, the 27.5-volt dc power supply connected to the main case will be connected only if the power supply output fails. In normal operation, relays K8, K9, and K12 (fig. 3-2) connect the power supply output to the main case and disconnect the 27.5-volt dc power supply from the main case input power circuit. If the power supply output fails, the actions of Zener diode CR16, resistor R3, and transistor Q1 will deenergize relay K8 as the power supply output voltage drops below 10 volts. With relay K8 deenergized, the power supply is disconnected from the main case input power circuit, deenergizing relay K12 and energizing relay K11. Allow at least 8 to 10 seconds for the power supply output voltage to drop from 10 volts to the dropout voltage of relay K12. With K11 energized, the 27.5-volt dc power supply is connected to the main case input power circuit.

(2) Closing circuit breakers CB1 through CB6 provides 27.5 volts dc to transceivers No. 1 and No. 2, the preselector, and the power inverter. Power to the antenna coupler is fed by one of the transceivers (depending on the state of relay K4). All main case mounted equipment is controlled through two mode switches (S5A) in each of the two Controls, Radio Set C-7207/GRC. When S5A is set in any position except OFF, the equipment is functional. The equipment enable ground energizes relay K9 connecting 27.5 volts dc to the power inverter and Control-Monitor, Radio Set C-7196/GRC (control panel).

(3) TRANSCEIVER SELECT switch S1 (TM 11-5820-672-12) provides interconnection between one of the transceivers and the preselector and between the other transceiver and the antenna coupler. The switching occurs sequentially when relay K7 energizes. With switch S1 in the

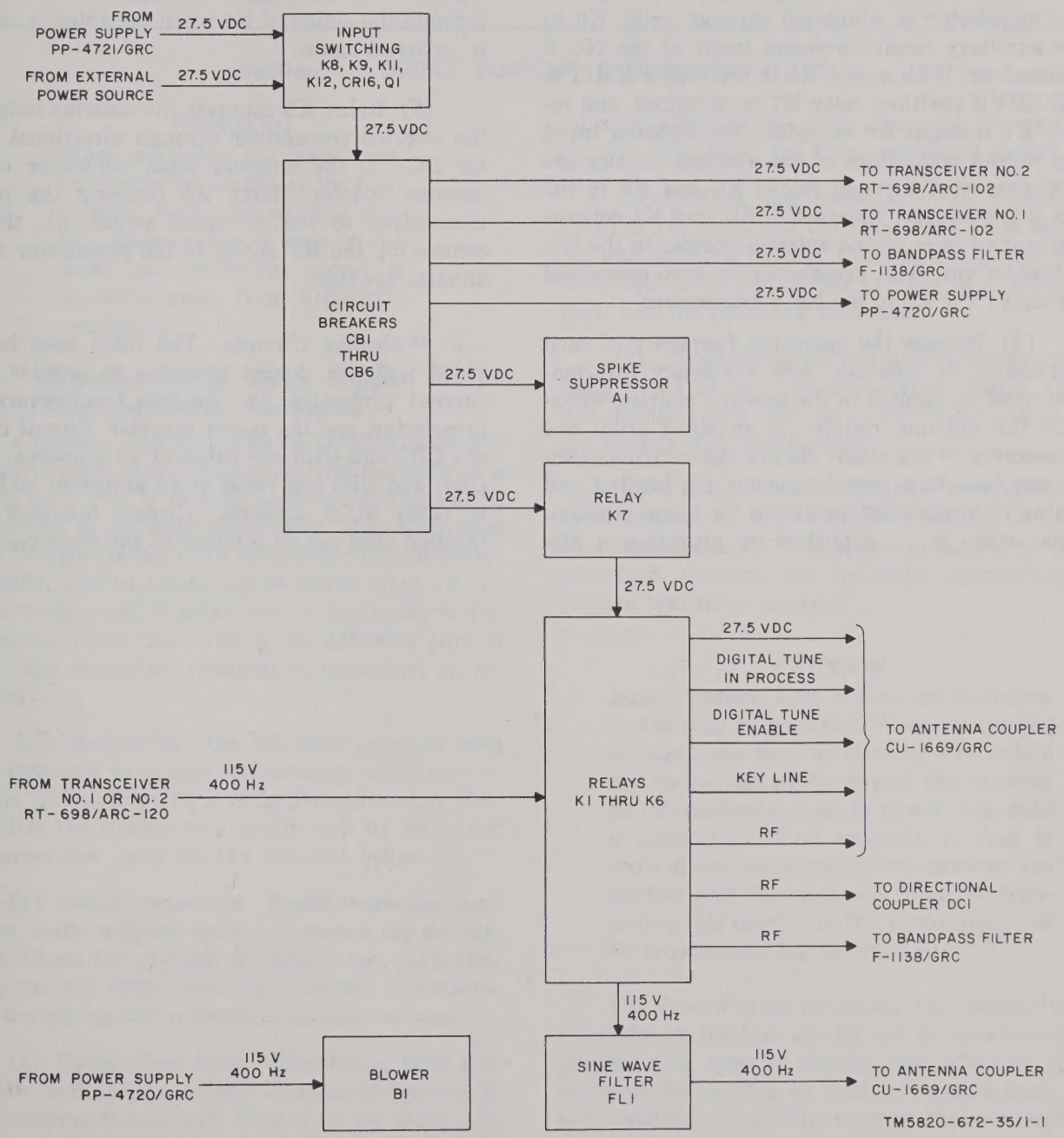


Figure 1-1. Cabinet, Electrical Equipment CY-6177/GRC, block diagram.

NO. 1 XMIT & RECEIVE position, relay K7 is deenergized, and in turn, deenergizing relays K1 through K6. The antenna coupler is then connected to the No. 1 transceiver. The transceiver antenna output is connected through relay K5 to the antenna coupler. The auxiliary receiver antenna output of the antenna coupler is connected through relay K6 to the auxiliary receiver antenna input of the transceiver. Relays K2, K3, and K4 connect the control lines of the antenna coupler to the No. 1 transceiver. The radio-frequency (RF) output of the preselector is connected through relay K6 to the auxiliary receive antenna input of the No. 2 transceiver. With switch S1 in the NO. 2 XMIT & RECEIVE position, relay K7 is energized, and relays K1 through K6 energize. The antenna input and output connectors of the antenna coupler are now connected through relays K5 and K6 to the No. 2 transceiver. Relays K2, K3, and K4 connect the control lines of the antenna coupler to the No. 2 transceiver. The preselector is now connected through relay K6 to the No. 1 transceiver.

(4) Because the operating frequency of each transceiver is different, new frequency information must be applied to the antenna coupler whenever the antenna coupler is switched from one transceiver to the other. Before the antenna coupler can tune to a new frequency, the loading and tuning elements must return to the home position. This action is accomplished by providing a discharged capacitor between the digital tune in process line and ground, through relay K1. When 27.5 volts appears on the digital tune in process line (antenna coupler is tuning) the discharged capacitor will produce a negative spike on the digital tune in process line, then will charge to 27.5 volts. This negative spike programs the loading and tuning elements in the antenna coupler to the home position, causing the antenna coupler to proceed through a complete tuning cycle. The charged capacitor is discharged through a 10K resistor through the action of K1 when the antenna coupler is switched again.

(5) Relay K5 connects the antenna output of the selected transceiver through directional coupler DC1 to the antenna input connector of the antenna coupler. Relay K5 connects the proper transceiver to control panel switch S1, thereby connecting the RF signal to the preselector or the antenna coupler.

b. Protective Circuits. The main case is provided with six circuit breakers to provide overcurrent protection for the two transceivers, the preselector, and the power inverter. Circuit breakers CB1 and CB3 are rated at 10 amperes; CB2, CB4, and CB5 are rated at 40 amperes; and CB6 is rated at 5 amperes. Circuit breakers CB1 through CB6 are on the rear of the main case.

CHAPTER 2

DIRECT AND GENERAL SUPPORT MAINTENANCE

Section I. DIRECT SUPPORT TROUBLESHOOTING

WARNING

When servicing the main case, be extremely careful of the high voltage. When performing routine maintenance or tests on the main case while the power is on, keep away from high-voltage points.

2–1. Organization of Direct Support Troubleshooting Procedures

a. General. The first step in troubleshooting a defective main case is to sectionalize the fault to a major area (fig. 2–1) such as the circuit breakers, the relays, or the spike suppressor. The second step is to localize the fault to a defective circuit breaker, or relay, and to locate the defective stage of the spike suppressor. A third step is applicable to the spike suppressor for locating the defective part in the stage suspected (transistor, capacitor, or resistor).

b. Sectionalization. The following group of tests are arranged to reduce unnecessary work and to aid in troubleshooting a defective main case. Sectionalize the trouble to a faulty unit by following the procedure listed in (1) and (2) below:

(1) *Visual inspection.* Visual inspection may locate faults without testing or measuring the circuits. Check for physical damage to any parts that comprise the main case. Examine the receptacles and the wiring for evidence of damage or wear.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. If the components normally housed in the main case are available, perform an operational check with all components in the main case (use Power Supply PP–4721/GRC for this operational check).

c. Localization and Isolation. The procedures given in (1), (2), and (3) below will aid in localizing and isolating trouble. Localize the trouble to an area, and then isolate the trouble to a defective part. Use the following methods.

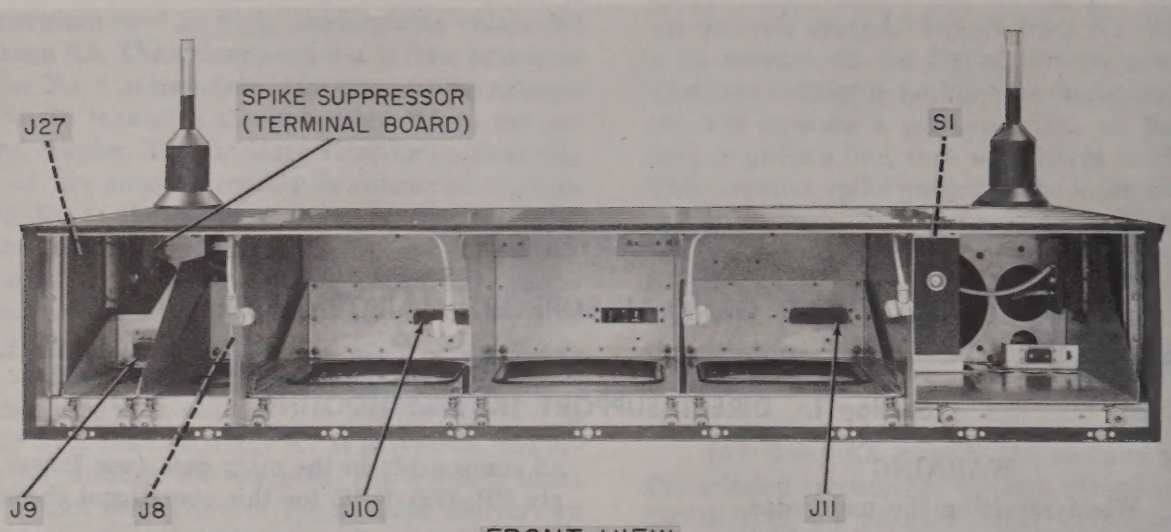
(1) *Troubleshooting chart.* The trouble symptoms listed in the troubleshooting charts (para 2–4 through 2–7) will aid in localizing and isolating trouble to a specific part.

(2) *Voltage and resistance measurements.* Most troubles must be located by voltage or resistance measurements. The spike suppressor is transistorized. Observe the following precautions to prevent transistor damage.

CAUTION

Make voltage and resistance measurements *only as specified.* When measuring voltages, use tape or sleeving to insulate the entire test probe, except the extreme tip. A momentary short circuit can ruin a transistor. (*For example,* if bias is shorted out, excessive current between the emitter and the base may ruin the transistor.) Be careful in the performance of all troubleshooting techniques.

(3) *Intermittent troubles.* The possibility of intermittent troubles should not be overlooked. If present, this type of trouble may often be made to appear by tapping or jarring the main case. For such trouble, check the wiring, the connections, and the jacks of the main case.



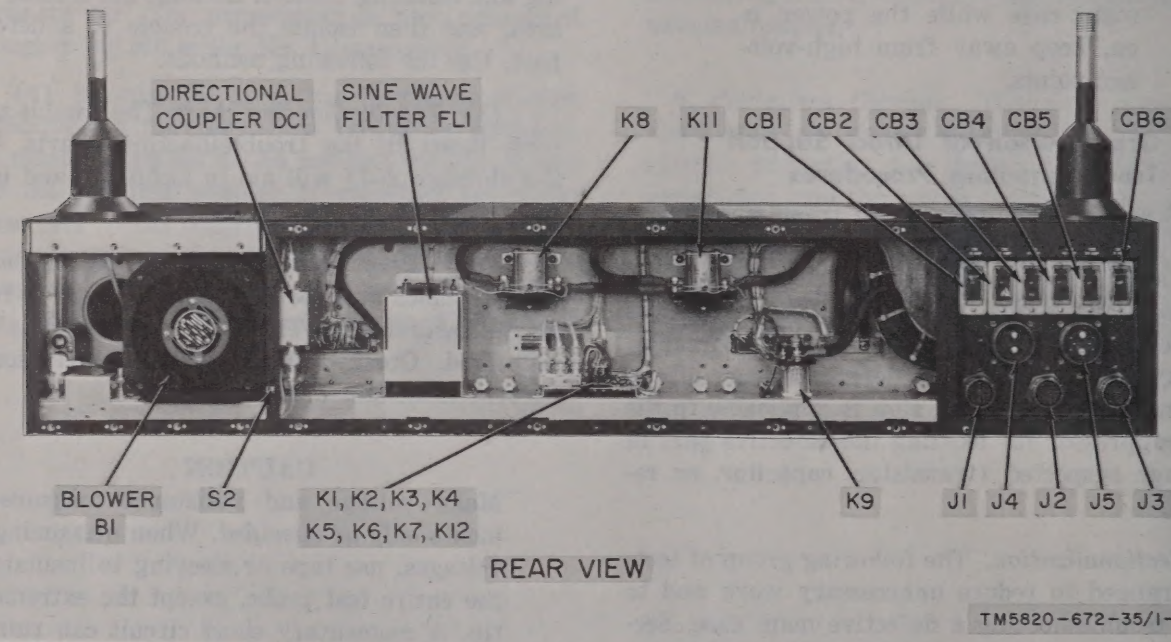


Figure 2-1. Cabinet, Electrical Equipment CY-6177/GRC, parts location.

2-2. Test Equipment and Additional Equipment Required

The test equipment and additional equipment required for troubleshooting the main case are listed below. Also, the associated technical manuals for the equipment are listed. If the specific test equipment model is not available, other test equipment having similar characteristics may be used.

a. Test Equipment. Multimeter ME-26A/U, ME-26B/U, ME-26C/U, or ME-26D/U (TM 11-6625-200-15) is the only test equipment required.

b. Additional Equipment Required.

Equipment	*References*
Tool Kit, Electronic Equipment TK-100/G.	SC 11-4-5180-S21
Tool Kit, Electronic Equipment TK-105/G.	SC 5180-91-CL-R07
Dc power supply (Precise Measurement Co.)	

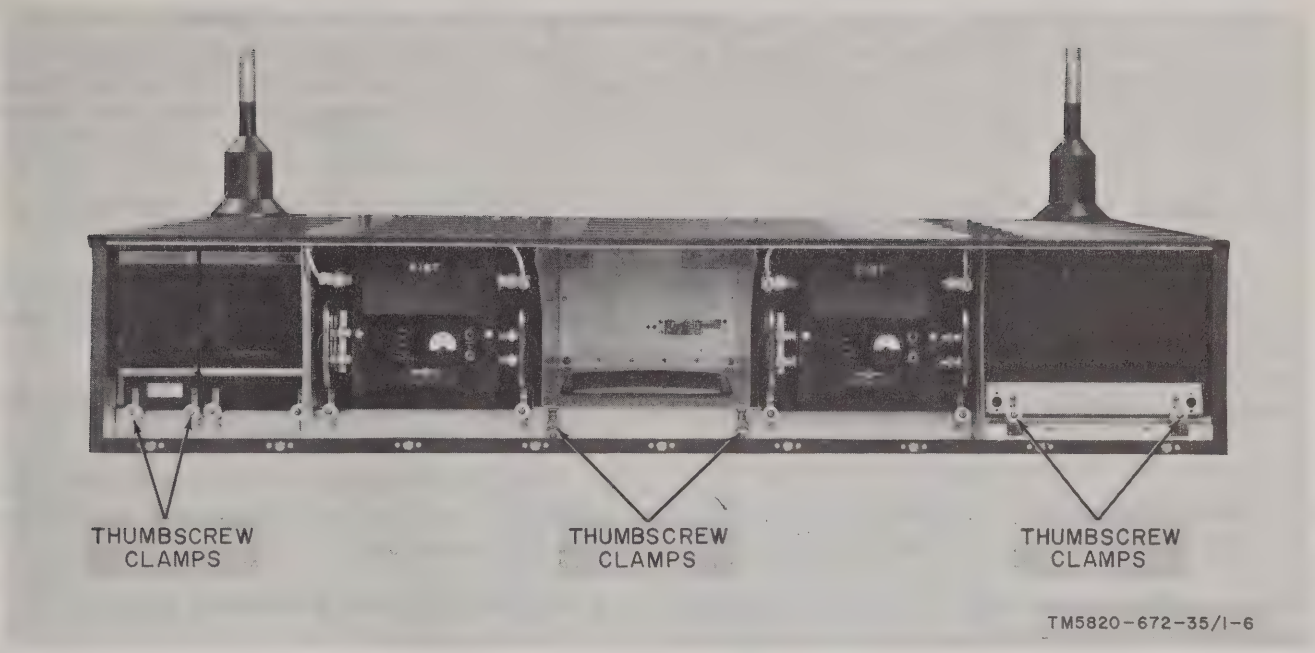


Figure 2-2. Thumbscrew locations.

Equipment	*References*
100 volts dc, 100 amperes dc, or a power supply capable of providing a variable output voltage from 0 to 50 volts dc, and 20 amperes of dc current.	

2-3. Test Setup

Troubleshooting procedures for the main case require connection to a dc power supply and to the multimeter (fig. 2-5). Make the test setup by connecting the dc power supply to pins A (+) and G (−) on main case connector J5 as shown in B, figure 2-5, and adjust the dc power supply for 27.5 volts dc output. Install the power inverter in the main case as outlined in TM 11-5820-672-12. Connect the multimeter as instructed in the troubleshooting chart.

2-4. Direct Support Main Case Troubleshooting Procedure

a. General. The procedures given in the chart below aid in localizing troubles to the main case input circuits. The checks are conducted with the main case connected to the dc power supply.

b. Direct Support Troubleshooting Chart.

Item	*Indication*	*Probable trouble*	*Procedure*
1	No power is applied to No. 1 transceiver when transceiver is in the main case.	Circuit breakers CB1 and CB2 open or defective.	Turn the dc power source to the main case on and measure the voltage with the multimeter (set SELECTOR switch to + and RANGE switch to 30V) between K8-A2 and chassis ground; then take readings for 27.5 volts dc at J10-17, J10-15, J10-14, J10-13, J10-3, J10-2, J10-1, J10-4, J10-16, and J10-56.
2	No power is applied to No. 2 transceiver when transceiver is in the main case.	Circuit breakers CB3 and CB4 open or defective.	Measure the voltage with the multimeter between K8-A2 and chassis ground. Check for 27.5 volts dc at J11-17, J11-15, J11-14, J11-13, J11-3, J11-2, J11-1, J11-4, -16, and -56.
3	Power inverter does not receive input power.	Circuit breaker CB5 open or defective.	Measure voltage with multimeter between ground and J9-1 and J9-2.
4	No input power to pre-selector.	Circuit breaker CB6 open or defective.	Measure voltage with multimeter between ground and J8-33 and J8-39.

Item	Indication	Probable trouble	Procedure
5	Blower B1 motor does not operate.	Blower motor B1 does not receive input power.	Set multimeter SELECTOR switch to AC and RANGE switch to 300. Measure voltage across blower motor between C17 and C18, or between J10-12 and J10-27.

2-5. Direct Support Spike Suppressor Circuit Trouble Localization Procedure

a. General. The procedures below aid in localizing troubles to parts or groups of parts within spike suppressor A1. Depending on the nature of the operational symptoms, one or more of the localizing procedures may be necessary.

NOTE

Spike suppressor A1 must be removed from the main case for troubleshooting.

b. Conditions for Test. All checks outlined below are to be conducted with the main case connected to a dc power supply. Refer to figures 2-1, 2-3, and 2-4 to locate parts or test points.

c. Removal and Replacement of Spike Suppressor A1 (fig. 2-3).

(1) *Removal.*

(*a*) Remove the four 4-40 screws on front of the tray that secure the tray assembly to the main case.

(*b*) Remove six 10-32 screws on the rear cover that secure the circuit breaker-electrical connector panel to the main case.

(*c*) Remove the two 10-32 screws that secure the tray assembly to the rear of the cabinet.

(*d*) Remove two lugs and tag cables secured to E5 and E6 on tray assembly.

(*e*) Unsolder and tag two red wires at C22 and three white wires at C23.

(*f*) Remove the tray assembly from the front of the cabinet by pulling forward.

(2) *Replacement.*

(*a*) Insert the tray assembly into the main case.

(*b*) Connect two red wires to terminal C22 and three white wires to terminal C23.

(*c*) Secure the cables to E5 and E6 on the tray assembly with two lugs.

(*d*) Secure the tray assembly to the rear of the main case with two 10-32 screws.

(*e*) Secure the circuit breaker-electrical connector panel to the main case with six 10-32 screws.

(*f*) Secure the front of the tray assembly to the main case with four 4-40 screws.

(3) *Spike suppressor A1 parts location.* The location of parts for spike suppressor A1 are illustrated on figure 2-4.

2-6. Voltage and Resistance Data

(fig. 2-4)

The charts given in *a* and *b* below provide information and instructions for performing voltage and resistance measurements on spike suppressor A1.

a. Resistance Data.

This equipment is transistorized; refer to paragraph 2-1 before proceeding with the measurements.

Transistor	Element	Negative lead to chassis (ohms)
Q1	E	0
	B	13
	C	23.0K
Q2	E	13
	B	14
	C	14.0K
Q3	E	1.3K
	B	10K
	C	6.6K
Q4	E	13
	B	1,100
	C	2.0K
Q5	E	0
	B	5.6K
	C	1.2K
Q6	E	7.5
	B	1.2K
	C	9K
Q7	E	0
	B	7.5
	C	9K
Q8	E	0
	B	7.5
	C	9K

b. Voltage Data. Connect the +27.5 volts dc power supply to E5 and the negative lead to E6.

CAUTION

This equipment is transistorized; refer to paragraph 2-1 before proceeding with the measurements.

Transistor	*Element*	*Dc voltage without spike (Volts ac)*	*Dc voltage with spike (Volts ac)*
Q1	E	0	0
	B	0	0.65
	C	0	0
Q2	E	0	0.65
	B	0	0.5
	C	28	28.0
Q3	E	28	41.0
	B	28	41.0
	C	0	41.0
Q4	E	0	0.65
	B	0	1.25
	C	0	0.75
Q5	E	0	0
	B	0	0.7
	C	28	0.1
Q6	E	0.9	0.25
	B	28	0.1
	C	1.0	41
Q7	E	0	0.25
	B	0.9	0
	C	0.5	41
Q8	E	0	0.25
	B	0.9	0
	C	0.5	41

2-7. Troubleshooting Cables

a. The power supply is connected to the main case by Cable Assembly, Special Purpose, Electrical CX-10359/G, and the control panel is connected to the main case by Cable Assembly, Special Purpose, Electrical CX-10356/G, Cable Assembly, Special Purpose, Electrical CX-10357/G, and

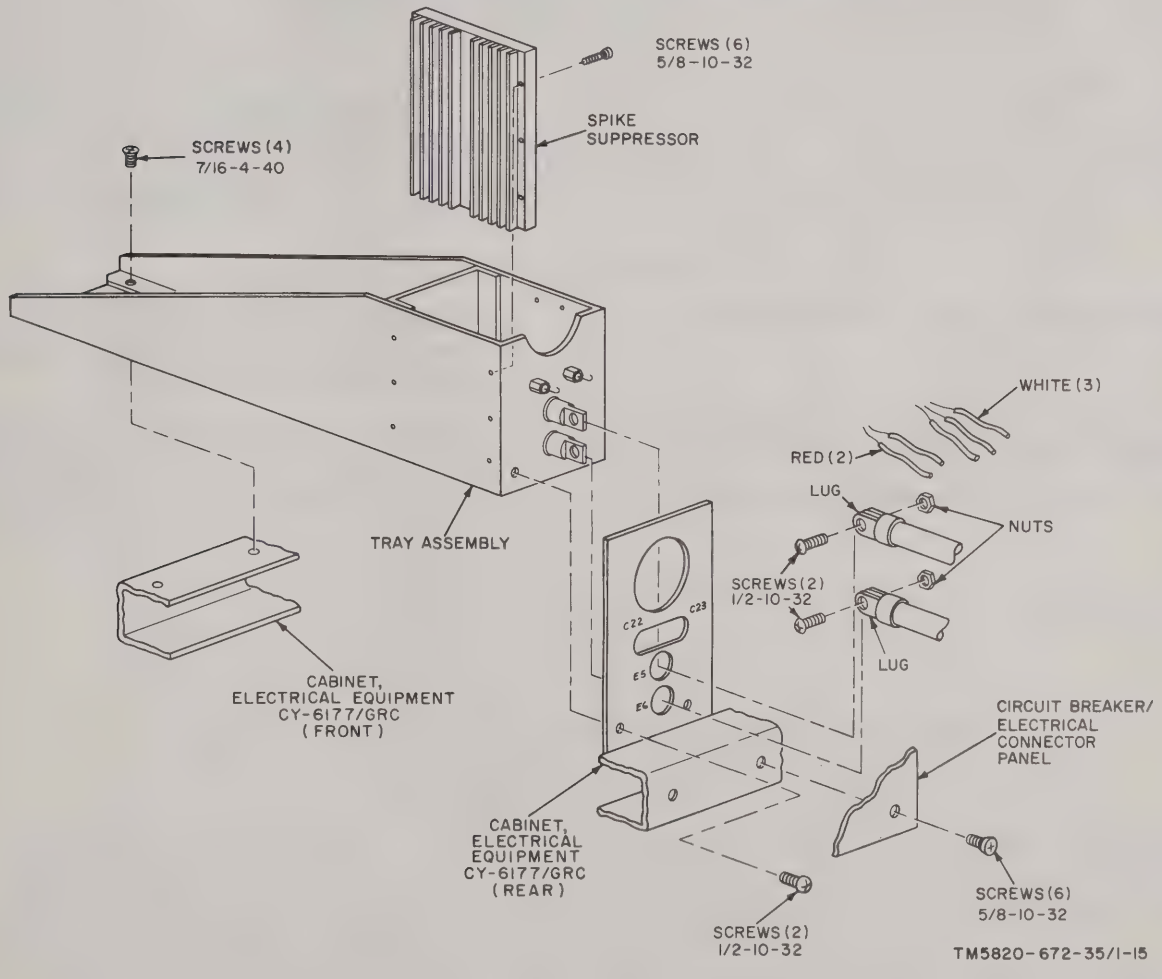


Figure 2-3. Spike suppressor A1, removal and replacement.

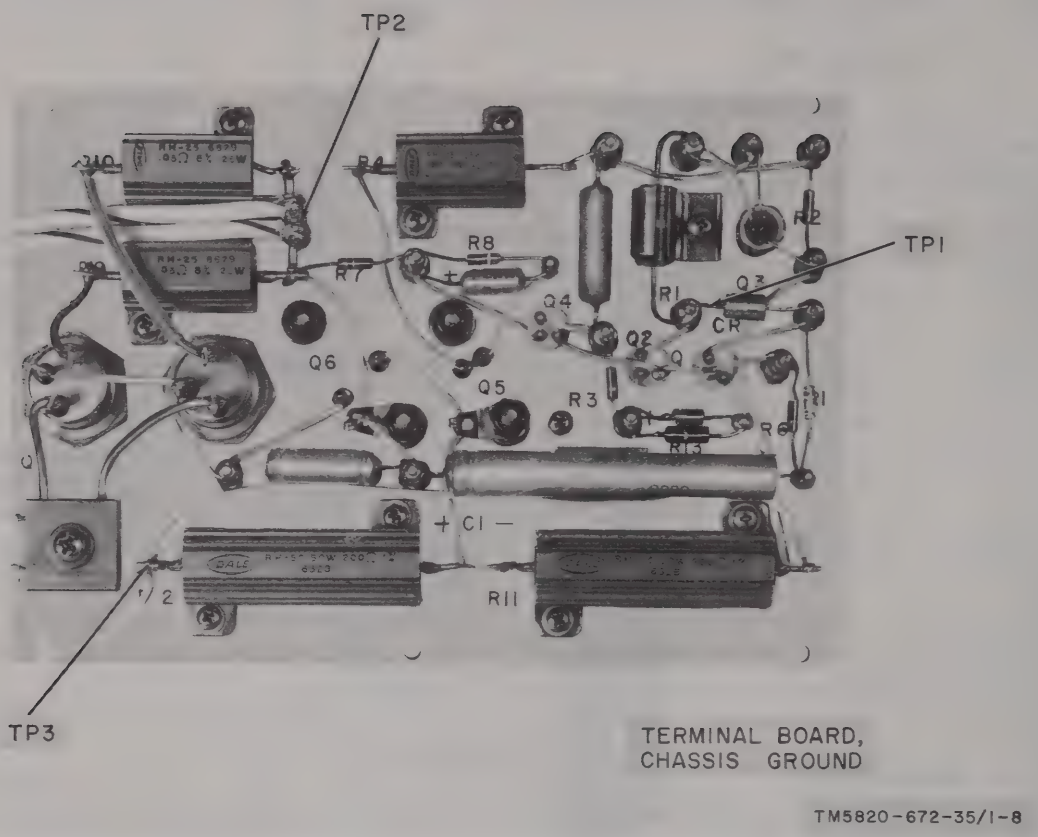


Figure 2-4. Spike suppressor A1 parts and test point locations.

Cable Assembly, Special, Purpose, Electrical CX-10358/G (fig. 3-3).

b. Troubleshooting these cables can be performed by visually examining the plugs for damage and observing the condition of the cables. Connect and disconnect the plugs to the jacks and note that there is no binding or excessive effort required to attach or remove the plugs.

c. Breaks in the cable leads can be located by taking ohmmeter checks with the multimeter; for example, zero ohms between P1-A and P2-A.

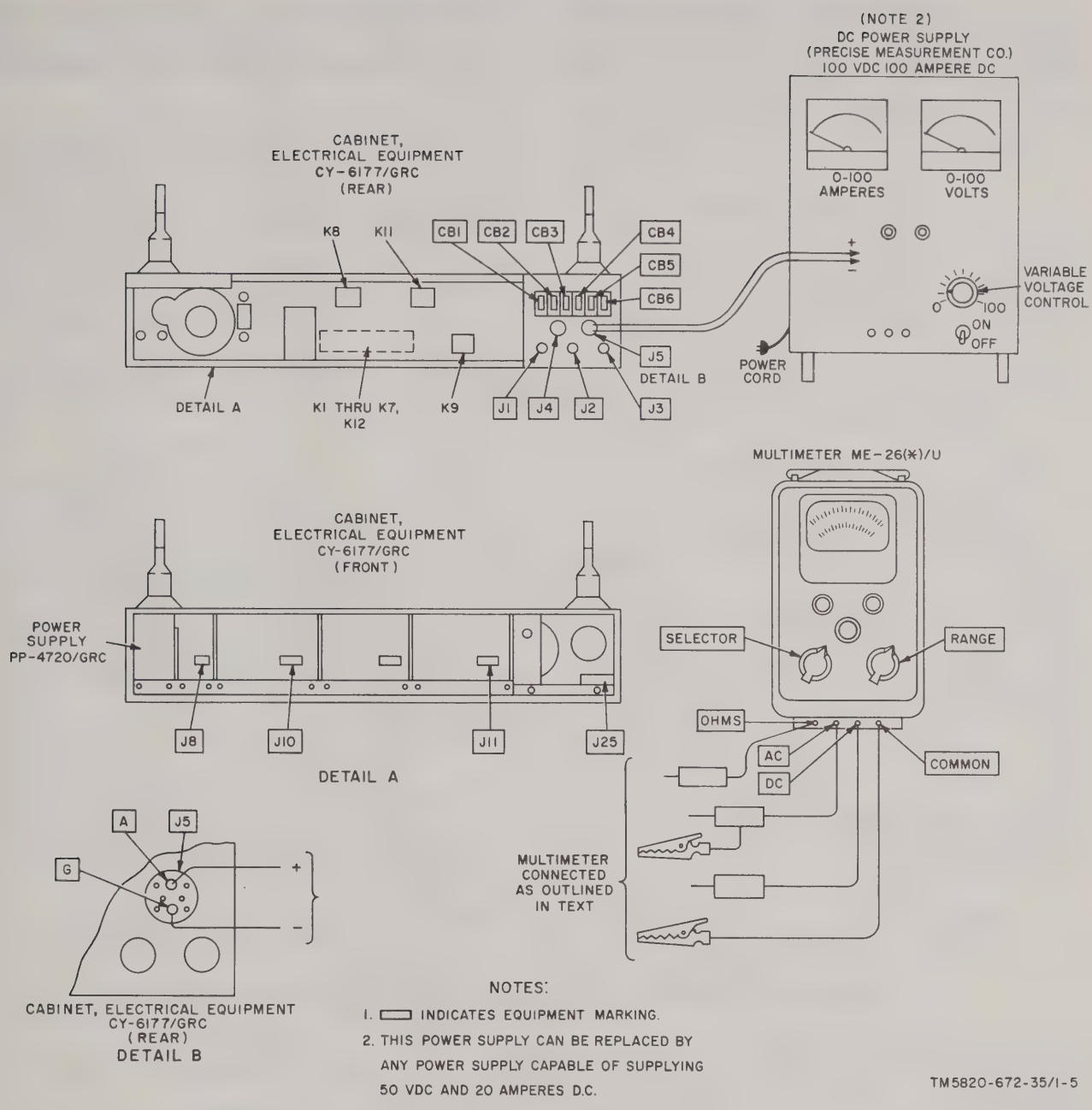


Figure 2–5. Test setup for troubleshooting.

Section II. GENERAL SUPPORT TROUBLESHOOTING AND TESTING PROCEDURES

2–8. Scope of General Support Troubleshooting

General support troubleshooting is the same as that authorized at the direct support category since no additional tools, test equipment, or parts are authorized at the general support category by the maintenance support plan. The removal and replacement of parts from the main case (except for suppressor A1 (para 2–5)) do not require special instructions (fig. 2–3).

2–9. General Support Testing Procedures

a. The testing procedures provided in this sec-

tion are prepared for use by general support category maintenance to determine the acceptability of repaired equipment. The procedures set forth specific requirements that a repaired main case must meet before it is returned to the using organization. Performance of certain of the procedures will

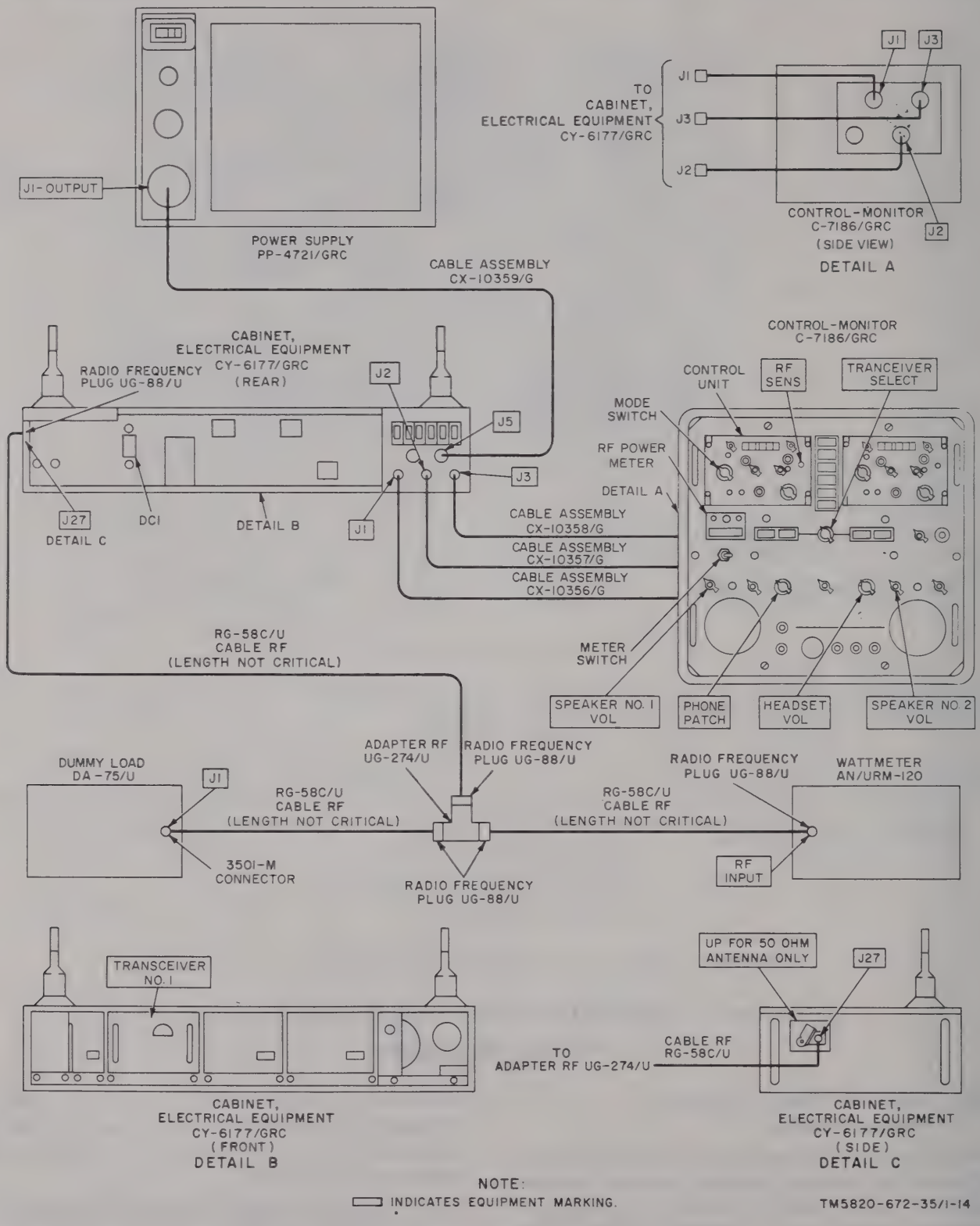


Figure 2-6. Directional coupler DC1, bench test setup.

also, at times, aid in sectionalizing the cause of defective operation. A summary of the performance standards is provided in paragraph 2–13.

b. Each test depends on the preceding one for certain operating procedures. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. For each step, perform all the actions required in the *Control settings* columns; then perform each specific test procedure and verify it against its performance standard.

c. Throughout the tests in paragraphs 2–11 and 2–12, power is not applied to jack J4 on the main case.

2–10. Modification Work Orders

The performance standards listed in the tests (para 2–11 and 2–12) assume that any modification work orders that may be required have been performed. A listing of current modification work orders will be found in DA Pamphlet 310–7.

2–11. Directional Coupler Test

a. Test Equipment and Materials. Power Supply PP–4721/GRC, Control-Monitor C–7186/GRC, Receiver-Transmitter, Radio RT–698/ARC–102, Wattmeter AN/URM–120, and Dummy Load DA–75/U.

b. Test Connections and Conditions. Connect the equipment as illustrated in figure 2–6.

c. Procedure.

Step No.	*Control settings*		*Test procedure*	*Performance standard*
	Test equipment	*Equipment under test*		
1	Turn on CB1 and CB2 on power supply.	Turn on CB1 through CB6 on the main case.		
2	On monitor, set meter switch to FWD.		Press push-to-talk switch on microphone, and read watts on RF POWER meter on monitor, then release push-to-talk switch.	Not less than 80 watts is indicated on wattmeter and RF POWER meter on monitor.
3	Set meter switch to REFL.		Press push-to-talk switch.	Not more than 10 watts is indicated on wattmeter and RF POWER meter on monitor.
4			Release push-to-talk switch.	
5	Turn off CB1 and CB2 on power supply.	Turn off CB1 through CB6 on main case.		

2–12. Spike Suppressor A1 Test

NOTE

Spike suppressor A1 must be removed from the main case for testing (para 2–5*c*).

a. Test Equipment and Materials. Oscilloscope, multimeter, ammeter, Multimeter Weston Instrument, Model No. 281 or equivalent), dc power supply (Precise Measurements Co., or dc power supply capable of providing 0 to 50 volts dc and 20 amperes), and an adjustable carbon pile capable of 1,000-watt dissipation.

b. Test Connections and Conditions. Connect equipment as shown in figure 2–7.

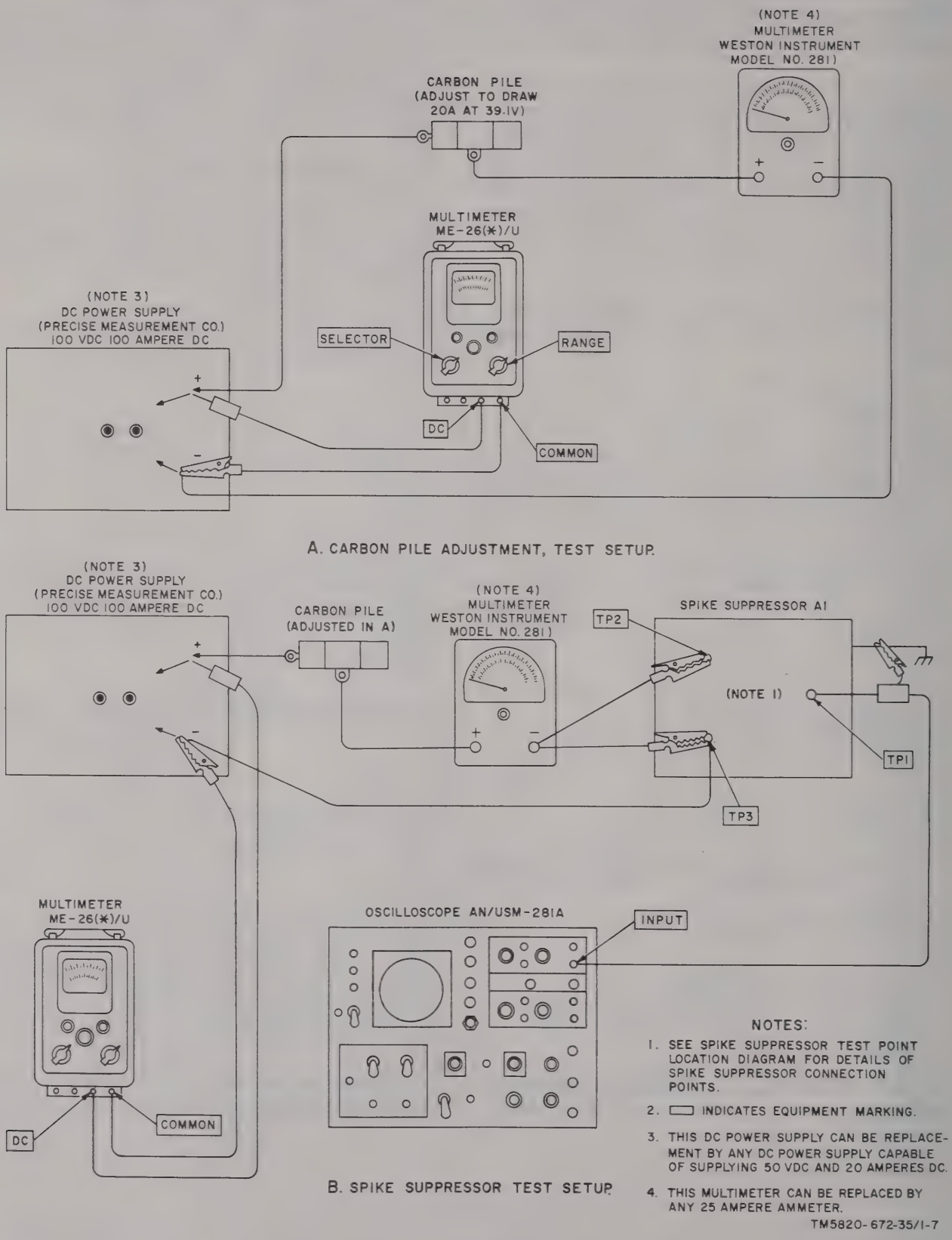


Figure 2-7. Spike suppressor A1, bench test setup.

c. Procedure.

Step No.	Control settings: Test equipment	Equipment under test	Test procedure	Performance standard
1	*Multimeter:* SELECTOR switch: + RANGE switch: 100V	N/A	Increase the dc power supply output voltage slowly and note the voltage just before current drops to zero.	Not lower than 37.1 volts; not higher than 41.1 volts.
2		N/A	Decrease dc power supply output voltage slowly and note voltage just before current starts to flow.	Not lower than 30.2 volts; not higher than 41.1 volts.
3	*Oscilloscope:* Adjust the oscilloscope controls for a horizontal sweep line on the screen.	N/A	Increase dc power supply output voltage slowly while monitoring ammeter. When current flow stops, observe waveform. It shall be presented on oscilloscope as shown on figure 2–8. Record period, T, and final voltage, V, as shown on figure 2–8.	Not less than 100 milliseconds; not more than 1,000 milliseconds. Not lower than 28.5 volts; not higher than 31.5 volts.
4		N/A	Measure voltage across R9 and R10 with test setup operating at 39.1 volts and at 20 amperes.	Not lower than 0.40 volt; not higher than 0.60 volt across either resistor.

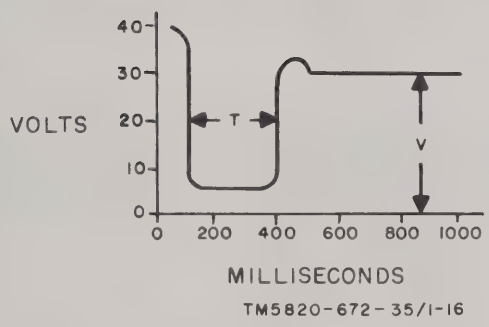


Figure 2–8. Oscilloscope waveform.

2–13. Summary of Test Data

Test	Performance standard
a. FWD, operation.	Not less than 80 watts.
b. REFL, operation.	Not more than 10 watts.
c. Dropout voltage level.	37.1 volts to 41.1 volts.
d. Restoration voltage level.	30.2 volts to 41.1 volts.
e. Time delay.	100 to 1,000 milliseconds and 28.5 volts to 31.5 volts.
f. Voltage across R9 and R10.	0.40 volt to 0.60 volt.

CHAPTER 3

DEPOT OVERHAUL STANDARDS

3-1. Applicability of Depot Overhaul Standards

a. The tests outlined in this chapter are designed to measure the performance capability of a repaired equipment. Equipment that is returned to stock should meet the standards given in these tests.

b. Applicable procedures of the Army depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3 form a part of the requirements for testing this equipment.

3-2. Test Procedures

a. The test equipment and power required for depot overhaul standards are the same as indicated in paragraphs 2-11 and 2-12.

b. The operational tests for depot overhaul standards are the same as the tests given in paragraphs 2-11 and 2-12. Perform the tests in the order in which they are given, and see that the results meet the minimum standard indicated in each test.

APPENDIX
REFERENCES

The following is a list of references applicable and available to the DS, GS, and depot maintenance personnel of Cabinet, Electrical Equipment CY-6177/GRC.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U.S. Army Equipment Index of Modification Work Orders.
SC 5180-91-CL-RO7	Tool Kit, Electronic Equipment TK-105/G.
SC 5180-91-CL-S21	Tool Kit, Electronic Equipment TK-100/G.
TB SIG 291	Safety Measures to be Observed When Installing and Using Whip Antennas, Field Type Masts, Towers, Antennas, and Metal Poles that are Used with Communication, Radar and Direction Finder Equipment.
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 255-2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 355-3	Depot Inspection Standard for Moisture and Fungus Resistant Treatment.
TM 11-5820-514-12	Organizational Maintenance Manual Including Repair Parts and Special Tool Lists: Radio Set AN/MRC-95.
TM 11-5820-514-35	DS, GS, and Depot Maintenance Manual: Radio Set AN/MRC-95.
TM 11-5820-672-12	Organizational Maintenance Manual: Radio Sets AN/GRC-158 and AN/MRC-117.
TM 11-6625-200-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Multimeters ME-26A/U, ME-26B/U, ME-26C/U, and ME-26D/U.
TM 11-6625-203-12	Operator and Organizational Maintenance: Multimeter AN/URM-105, Including Multimeter ME-77/U.
TM 11-6625-446-15	Operator, Organizational, Field and Depot Maintenance Manual: Wattmeter AN/URM-120.
TM 11-6625-573-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Signal Generator AN/GRM-50.
TM 11-6625-683-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Signal Generator AN/URM-127.
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207.
TM 11-6625-1703-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Oscilloscope AN/USM-281.
TM 38-750	Army Equipment Record Procedures.

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY CB	0	0	1			±20%	±20%		A			$-55°_{TO}+70°C$	10-55 Hz
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				$-55°_{TO}+85°C$	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				$-55°_{TO}+125°C$	10-2,000Hz
GREEN		5	5		±5%				F			500		
BLUE		6	6										$-55°_{TO}+150°C$	
PURPLE (VIOLET)		7	7											
GREY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN				±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		± 2.0 UUF	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25 UUF	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5 %	± 0.5 UUF	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0 UUF	
SILVER							

1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF.
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS: MIL-C-5, MIL-C-25D, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.

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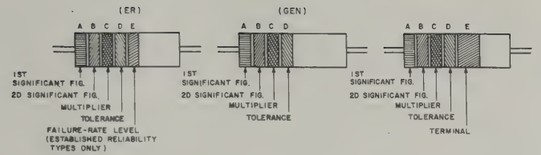
Figure 3-1. Color code marking for MIL-STD resistors, inductors, and capacitors.



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS.

TABLE I
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM.
BLACK	0	BLACK	0	BLACK	1			BROWN	M	
BROWN	1	BROWN	1	BROWN	10			RED	P	
RED	2	RED	2	RED	100			ORANGE	R	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP. TYPE ONLY)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	1.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE.

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL. ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

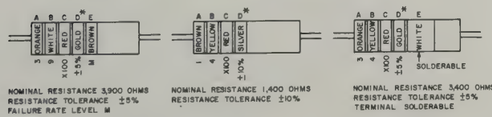
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED, IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

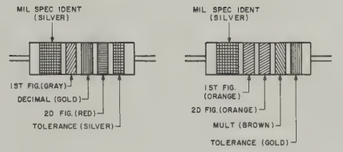
NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS — FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD.

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED

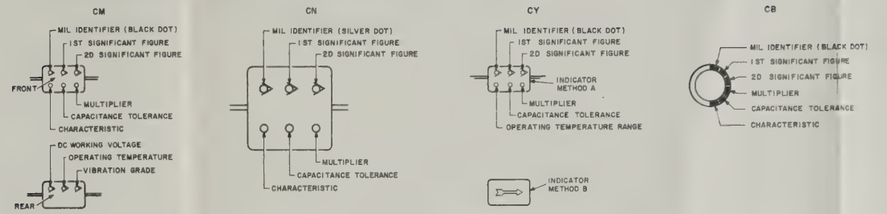
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

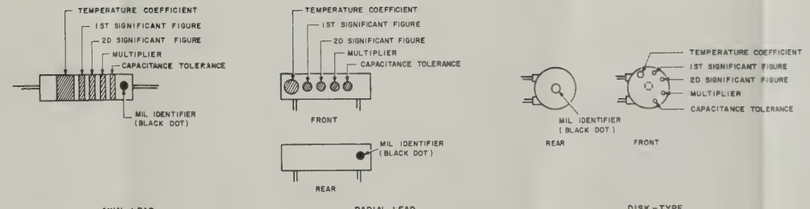
COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB.





C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2D SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY, CB	0	0	1			±20%	±20%		A			−55° TO +70°C	10-55 HZ
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				−55° TO +85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				−55° TO +125°C	10-2,000HZ
GREEN		5	5		±5%				F			500		
BLUE		6	6										−55° TO +150°C	
PURPLE (VIOLET)		7	7											
GREY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN				±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	−30	1	1	10	±1%		
RED	−80	2	2	100	±2%	±0.25 UUF	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		±5%	±0.5 UUF	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	±10%		
GOLD	+100					±1.0 UUF	
SILVER							

1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS: MIL-C-5, MIL-C-250, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE

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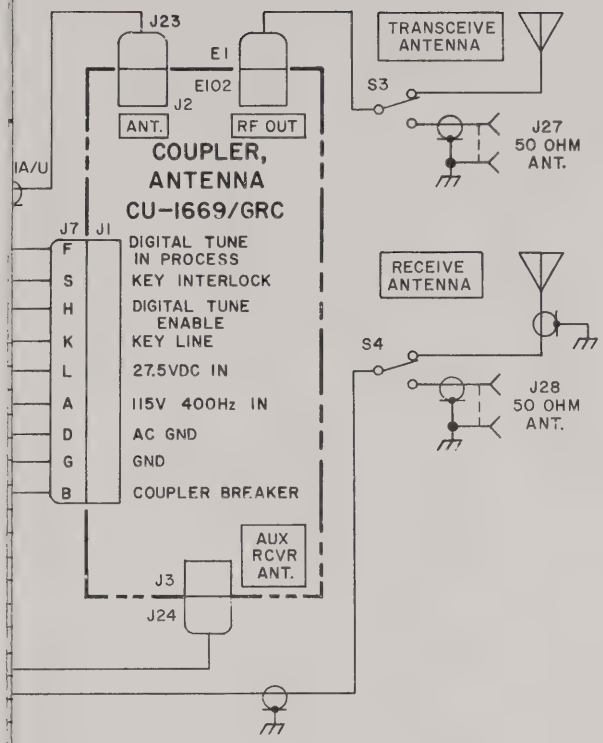
Figure 3-1. Color code marking for MIL-STD resistors, inductors, and capacitors.



NOTES:

UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.

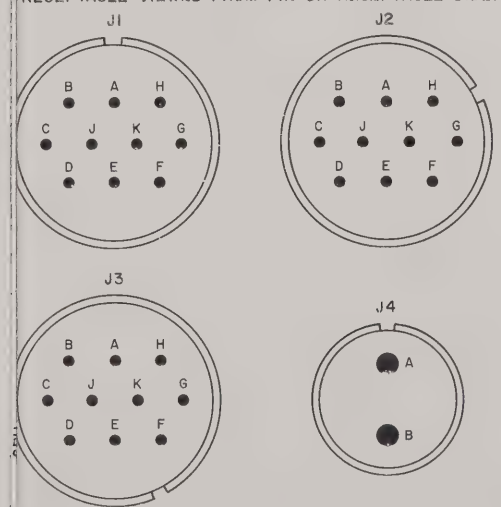
2 UNLESS OTHERWISE INDICATED, ALL DIODES TYPE ARE IN4002.

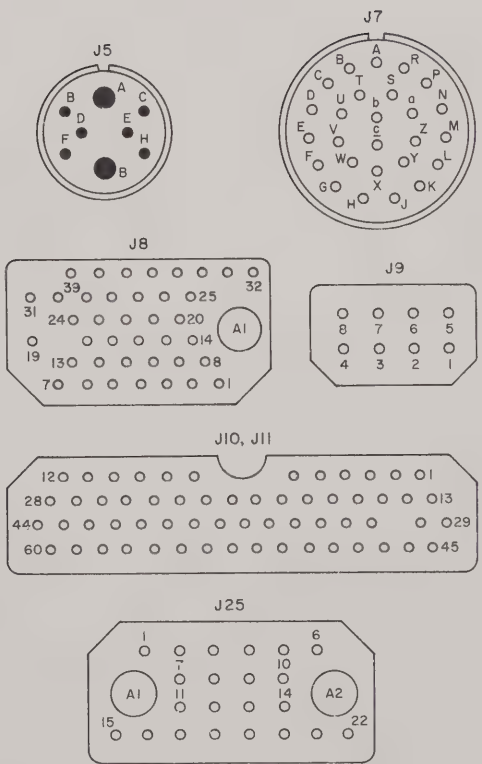
REMC NONSTANDARD ABBREVIATIONS:
SB - SIDEBAND
E REFL - REFLECTED

ALL CIRCUIT BREAKERS ARE SHOWN IN TRIPPED POSITION.

C ▭ INDICATES EQUIPMENT MARKING.

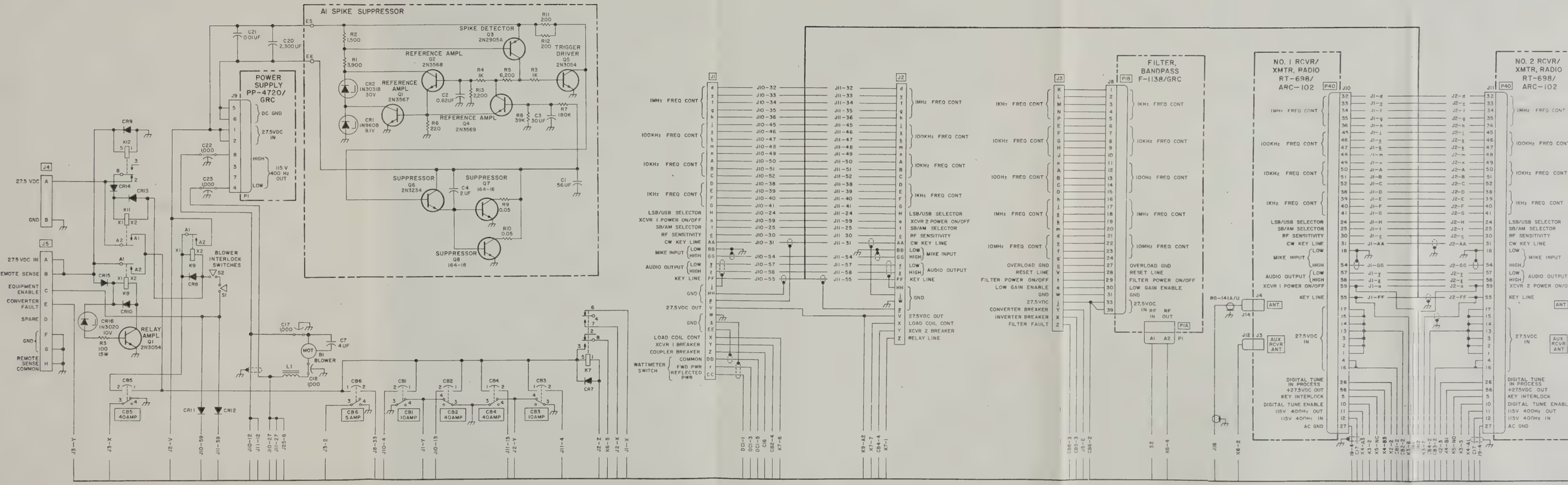
RECEPTACLE VIEWED FROM PIN OR RECEPTACLE SIDE.

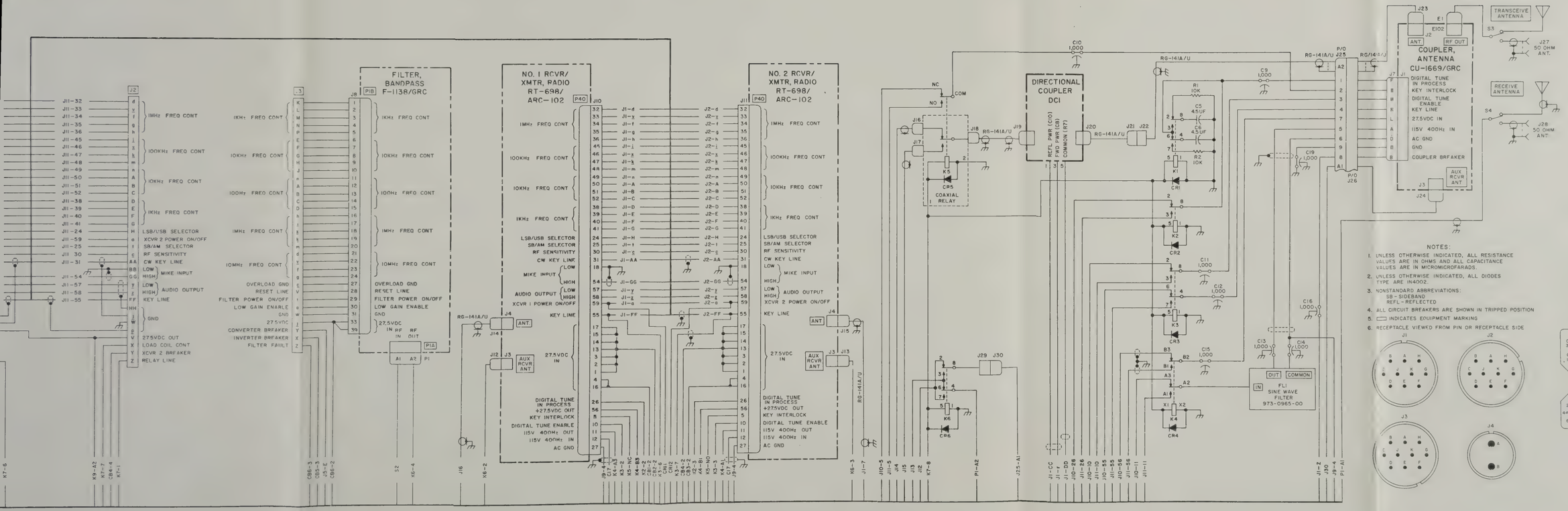




TM5820-672-35/1-2

3-2. Cabinet, Electrical Equipment CY-6177/GRC, overall schematic diagram.


A1 SPIKE SUPPRESSOR
POWER SUPPLY PP-4720/ GRC
SPIKE DETECTOR Q3 2N2905A
REFERENCE AMPL Q2 2N3568
REFERENCE AMPL Q1 2N3567
REFERENCE AMPL Q4 2N3569
TRIGGER DRIVER Q5 2N3054
SUPPRESSOR Q6 2N3234
SUPPRESSOR Q7 164-16
SUPPRESSOR Q8 164-18
RELAY AMPL Q1 2N3054
BLOWER INTERLOCK SWITCHES
MOT B1 BLOWER
FILTER, BANDPASS F-1138/GRC
NO. 1 RCVR/ XMTR, RADIO RT-698/ ARC-102
NO. 2 RCVR/ XMTR, RADIO RT-698/ ARC-102
IMHz FREQ CONT
100KHz FREQ CONT
10KHz FREQ CONT
1KHz FREQ CONT
LSB/USB SELECTOR
XCVR 1 POWER ON/OFF
SB/AM SELECTOR
RF SENSITIVITY
CW KEY LINE
MIKE INPUT
AUDIO OUTPUT
KEY LINE
GND
27.5VDC OUT
LOAD COIL CONT
XCVR 1 BREAKER
COUPLER BREAKER
WATTMETER SWITCH
FWD PWR
REFLECTED PWR
COMMON
XCVR 2 POWER ON/OFF
XCVR 2 BREAKER
RELAY LINE
100MHz FREQ CONT
OVERLOAD GND
RESET LINE
FILTER POWER ON/OFF
LOW GAIN ENABLE
27.5VDC IN
CONVERTER BREAKER
INVERTER BREAKER
FILTER FAULT
DIGITAL TUNE IN PROCESS
+27.5VDC OUT
KEY INTERLOCK
DIGITAL TUNE ENABLE
115V 400Hz OUT
115V 400Hz IN
AC GND



NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
2. UNLESS OTHERWISE INDICATED, ALL DIODES TYPE ARE IN4002.
3. NONSTANDARD ABBREVIATIONS:
   SB - SIDEBAND
   REFL - REFLECTED
4. ALL CIRCUIT BREAKERS ARE SHOWN IN TRIPPED POSITION
5. ▭ INDICATES EQUIPMENT MARKING
6. RECEPTACLE VIEWED FROM PIN OR RECEPTACLE SIDE

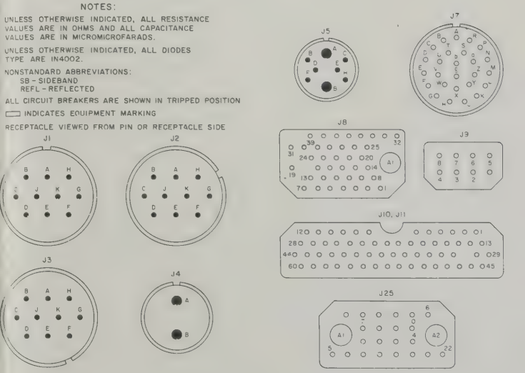


Figure 5-8. Cabinet, Electrical Equipment CY-6177/GRC, overall schematic diagram.

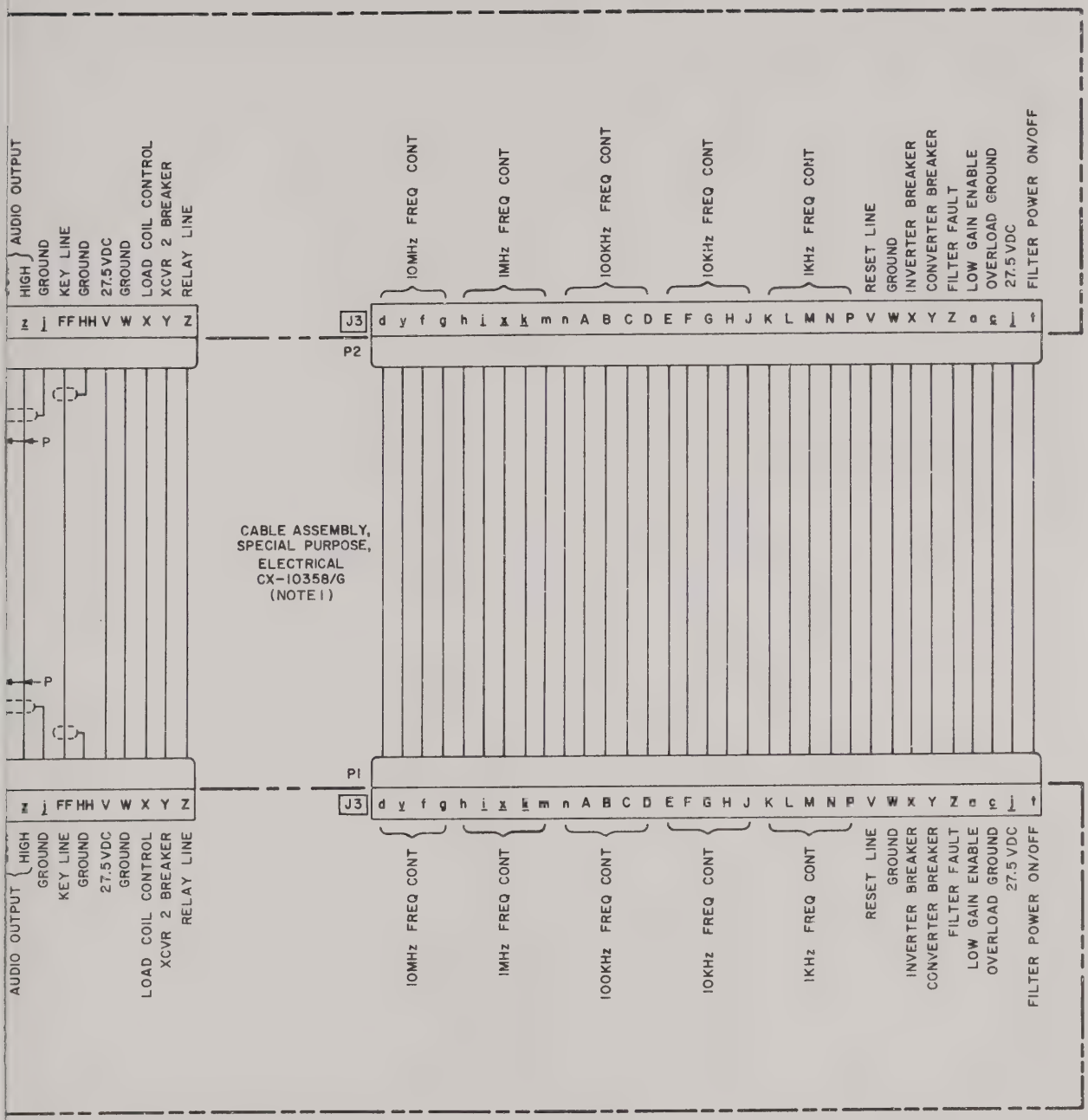
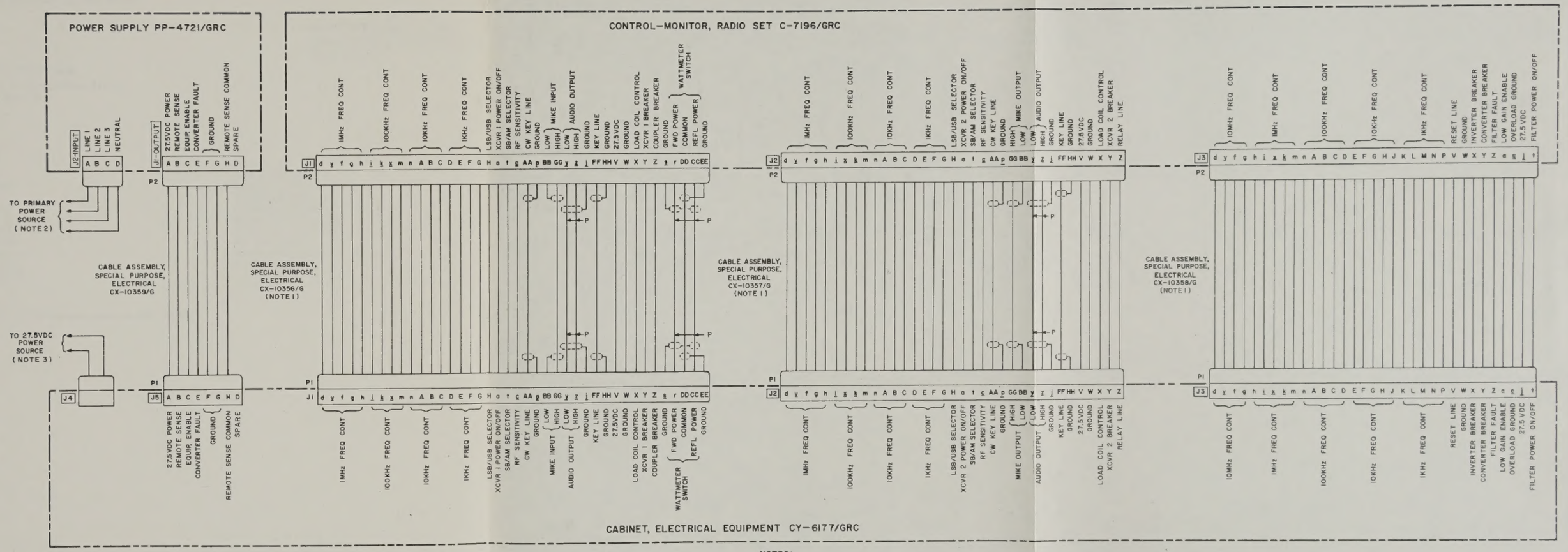


Figure 3-3. Cabinet, Electrical Equipment CY-6177/GRC, interconnect wiring diagram.

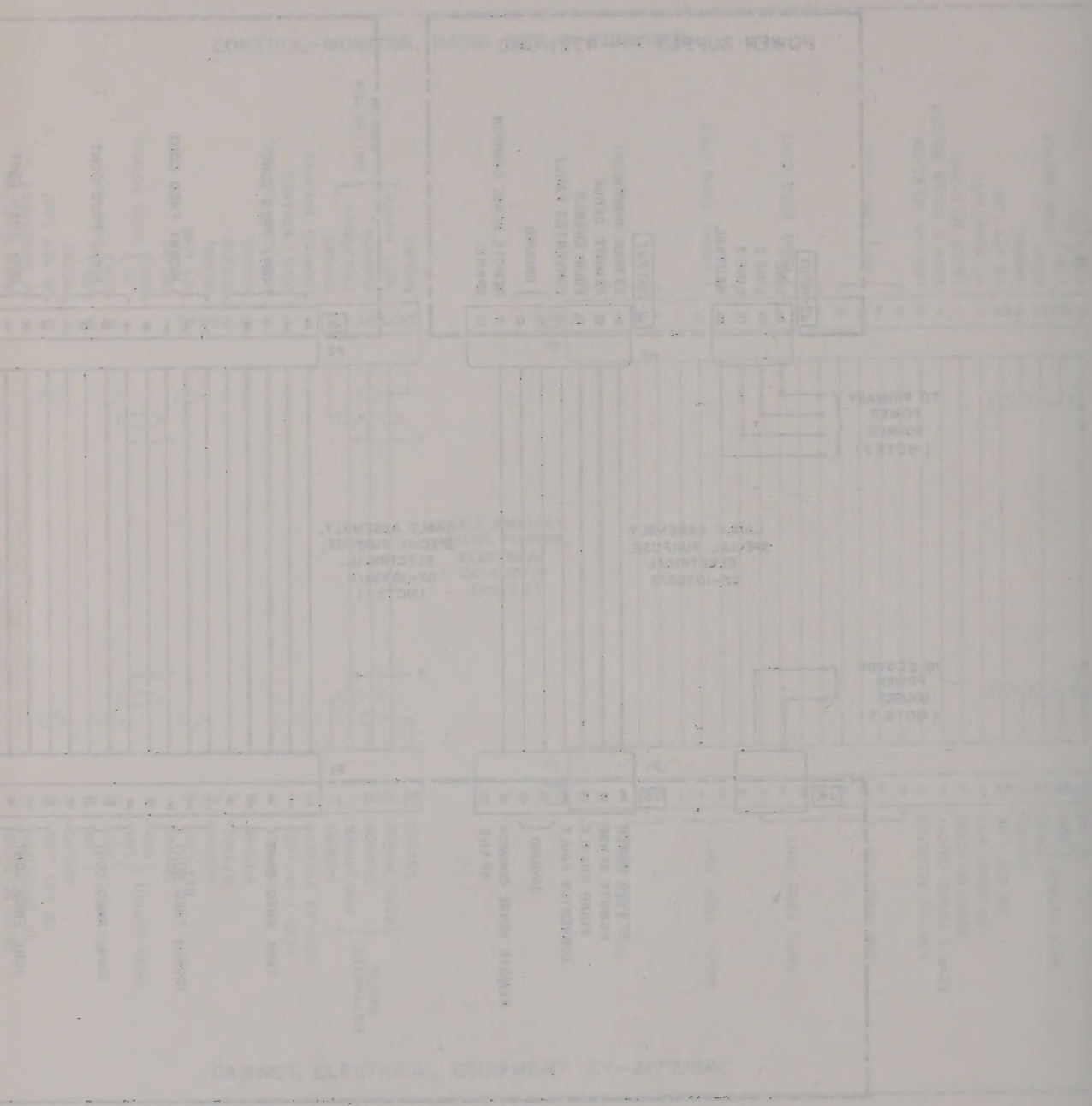


NOTES:

1. ALL CABLES EXCEPT CX-10359/G ARE IDENTICAL, ONLY THE CONNECTORS USED ARE SHOWN.
2. CONNECT 90 TO 140 VOLT, 3 PHASE, 4 WIRE PRIMARY POWER SOURCE TO ALL 4 LINES. CONNECT 90 TO 140 VOLT, 3 PHASE, 3 WIRE PRIMARY POWER SOURCE BETWEEN LINE 1, LINE 2, AND NEUTRAL. CONNECT 90 TO 140 VOLT, SINGLE PHASE PRIMARY POWER SOURCE BETWEEN LINE 2 AND NEUTRAL. CONNECT POSITIVE SIDE OF 90 TO 140 VOLT DC PRIMARY POWER SOURCE TO LINES 1, 2 AND 3, NEGATIVE SIDE TO NEUTRAL.
3. 27.5 VDC POWER SOURCE IS REQUIRED ONLY WHEN POWER SUPPLY PP-4721/GRC IS NOT IN OPERATION.
4. ☐ INDICATES EQUIPMENT MARKING.

TM5820-672-35/1-3

Figure 3-3. Cabinet, Electrical Equipment CY-6177/GRC, interconnect wiring diagram.



By Order of the Secretary of the Army:

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General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
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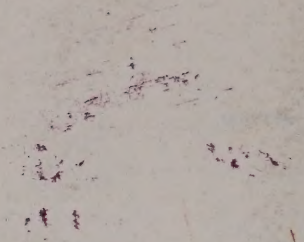
NG: None.
USAR: None.
For explanation of abbreviations used, see AR 310-50.

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